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Potential of Missing Life-Threatening Arrhythmias After Limiting the Use of Cardiac Telemetry

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We previously revised our telemetry protocol by using the American Heart Association guidelines, producing a 43% decrease in telemetry initiation.[1,2] After determining that there was no increase in mortality, cardiac arrest, or activation of the rapid response team, we sought to ascertain the risk of missing life-threatening arrhythmias (LTAs) with reduced telemetry use. Life-threatening arrhythmias, such as ventricular tachyarrhythmias, are the primary rationale for using telemetry, and fear of missing them likely contributes to overuse. We studied the nature and clinical outcome of our telemetry alarms. We hypothesized that alarms representing LTAs are uncommon and that few alarms affect patient management.

Methods

In March 2013, we instituted a revision of non–intensive care unit telemetry that integrated the current American Heart Association guidelines[2] into our electronic ordering system. Predefined criteria (developed internally at our institution and in use for many years before our telemetry protocol revision) categorized telemetry alarms as emergency or nonemergency. Alarm events were communicated from a central monitoring department to patient care units via telephone, and a detailed log of alarms was maintained.

We selected 2 periods—before (October 19, 2012, to November 19, 2012) and after (May 22, 2013, to June 19, 2013) revision—to retrospectively review alarm logs. We tabulated the

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Author Contributions: Drs Kansara and Doorey had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Kansara, Dressler, Weiner, Kerzner, Weintraub, Doorey.
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total number of alarms and studied, in detail, a random selection of alarm logs. All alarms designated as emergency in these subgroups were then evaluated with a detailed medical record review, arrhythmia analysis, and determination of whether any change in clinical management followed.

Emergency alarms were divided into 3 classes: potential LTAs, clinically important alarms, and alarms of questionable importance. Management changes included transferring to an intensive care unit, beginning use of a new medication, ordering a diagnostic study, or activating a rapid response or cardiac arrest team. The study was approved by the institutional review board at Christiana Care Health System. Informed consent was not required.

Statistical analysis was performed using the t test and χ^2 test.

Results

Emergency alarms were infrequent (Table 1). All alarm logs for 1323 and 1322 randomly selected patients from the periods before and after revision, respectively, were examined in detail. The total number of alarms, examined in detail, was 4106 and 3094, respectively. There was only 1 potentially LTA alarm (0.01%) of the 7200 total alarms in these subgroups (Table 2). This patient had a self-terminated ventricular tachycardia that lasted 32 seconds. Thus, there was not a single LTA for which telemetry led to an immediate treatment during the study period. Of the 78 emergency alarms, 29 (37.2%) were classified as clinically important. However, only 14 (48.3%) of these 29 alarms led to a change in clinical management within 1 hour. Most of these alarms were for rapid atrial tachyarrhythmia. Telemetry length declined after the revision due to prespecified durations.

Discussion

Even among the alarms designated as emergency, we found episodes of clinically important arrhythmias to be very infrequent, rarely leading to a change in patient management. Life-threatening arrhythmias were exceedingly rare, occurring in 1 of 2645 patients. Previous studies[3,4] have also found low rates of serious arrhythmias. In these studies, the incidence of LTA requiring immediate action was low, and there were few important changes in management or outcomes. For example, Schull et al[5] reported that, of 8932 patients undergoing telemetry, only approximately 1 (0.02%) in 5000 were survivors of cardiac arrest in whom telemetry signaled the cardiac arrest.

Medicolegal concerns may contribute to telemetry overuse. We believe our system mitigates this risk as an evidence-based standard of care applied to clinical decision making through protocols. Thus, reducing unnecessary telemetry use is not likely to miss LTAs because of the very low incidence of true LTAs in contemporary telemetry monitoring settings. This finding should be reassuring to those considering the recommendation of the Choosing Wisely campaign to limit non–intensive care unit telemetry.[5]

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Table 1

Alarms Before and After Revision of the Continuous Cardiac Telemetry Protocol

Variable	Before Revision (October 19, 2012, to November 19, 2012)	After Revision (May 22, 2013, to June 19, 2013)	*P* Value
Total No. of monitored patients during study periods	2658	2036	NA
Total No. of alarms from monitoring department during study periods	8273	4647	NA
Total No. (%) of emergency alarms from monitoring department during study periods[a]	70 (0.8)	46 (1.0)	.47
No. (%) of monitored patients examined in detail	1323 (49.8)	1322 (64.9)	NA
No. (%) of alarms examined in detail	4106 (49.6)	3094 (66.6)	NA
No. (%) of emergency alarms examined in detail[a] [95% CI]	42 (1.02) [0.99–1.05]	36 (1.16) [1.12–1.20]	.57
Mean (SD) length of monitoring per patient, d[b]	2.58 (8.64)	1.55 (1.45)	<.001
Mean (SD) No. of alarms per patient[a]	3.1 (3.0)	2.3 (2.7)	<.001
No. (%) of patients examined with no alarms[a]	341 (26)	397 (30)	.01

Abbreviation: NA, not applicable.

[a] *P* value obtained by χ^2 test.

[b] *P* value obtained by *t* test.

Table 2

Classification of Emergency Alarms

Variable	No. of Alarms	
	Before Revision (October 19, 2012, to November 19, 2012) (n = 42)	After Revision (May 22, 2013, to June 19, 2013) (n = 36)
Potentially LTA, sustained VT, VF, and pause >10 s[a]	1	0
Telemetry alarm led to immediate treatment	0	0
Telemetry alarm followed immediate treatment, problem detected by hospital staff before telemetry called	0	0
Clinically important arrhythmia, rapid SVT and AF >180/min, symptomatic heart rate <35/min, pause >5 s, second- or third-degree AVB, and recurrent NSVT	18	11
Recurrent NSVT	1	1
SVT, including AF with RVR	10	4
Pause >5 s, sinus, or AF	1	1
Symptomatic heart rate <35/min	2	3
Transient second- or third-degree AVB	4	2
Changes in patient management		
Telemetry alarm led to management change in 1 hour, SVT >180/min	10	4
Telemetry alarm influenced ultimate treatment decision, recurrent pause >3 s, and recurrent NSVT	2	2
Telemetry alarm did not lead to treatment or influence ultimate management decision	6	5
Arrhythmias of questionable importance (eg, asymptomatic heart rate <35/min with or without AF, or sinus pause of 3–5 s occurring during sleep or at rest, or details of alarms not available)	23	25

Abbreviations: AF, atrial fibrillation; AVB, atrioventricular block; LTA, life-threatening arrhythmia; NSVT, nonsustained ventricular tachycardia; RVR, rapid ventricular response; SVT, supraventricular tachycardia; VF, ventricular fibrillation; VT, ventricular tachycardia.

[a]One episode of VT of 32 seconds was detected. It was self-terminated, asymptomatic, and without any need for treatment.